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ABSTRACT

Inventors through the ages have engaged in an ongoing attempt to overcome barriers that can prevent effective distribution of knowledge. One barrier involves the accuracy with which the primary source can be represented, e.g., early non-face-to-face communication inventions (e.g., drums, horns, and smoke signals) were rather abstract, while recent inventions (e.g., radio and television) provide information seekers with more accurate verbal and visual facsimiles. Other barriers have to do with the speed and immediacy with which information can be comprehended without special effort or skills, and with the problem of quick, concise duplication of the original message for study and review. With the development of contemporary communication media, these barriers have been reduced substantially. However, public schools continue to rely on print as their primary source of information delivery. While the importance of print cannot be underestimated, it should be integrated with such media as audio recorded books, teletexts, video articles, motion pictures, television programs, long distance interactive verbal communications, and electronic print. These new media deliver many types of information faster, more accurately, and more cheaply than print, and the limitations that have kept educators from adopting them in the past have been largely overcome. The last remaining barrier lies within the institution of education, which must recognize that literacy no longer refers exclusively to print, and schools need to use the new media if education is to keep pace with societal changes. (BBM)

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THE EVOLUTION OF INFORMATION DELIVERY

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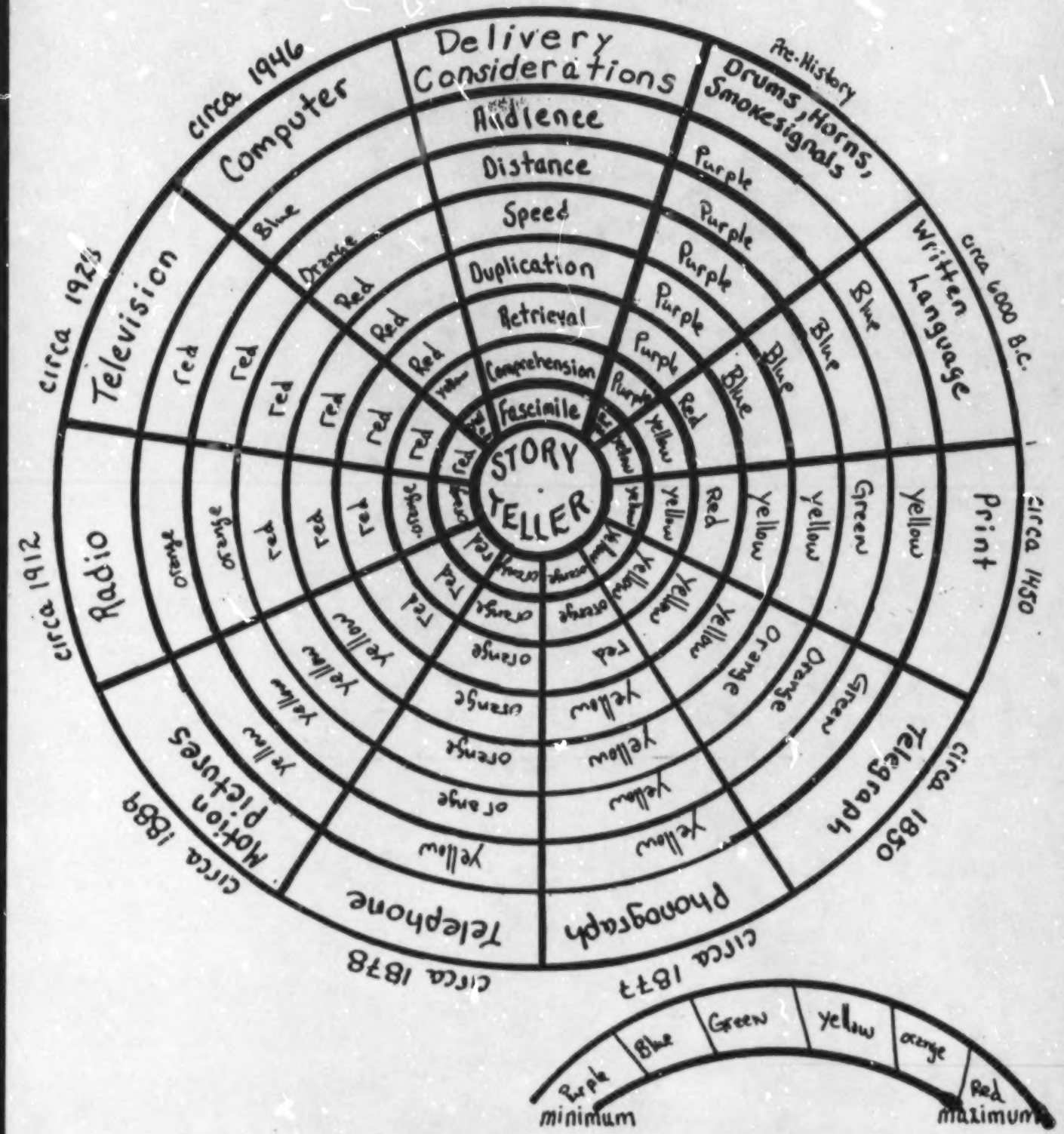

Figure 1: Inventions That Facilitate Communication

An important characteristic of the human family is its need and ability to communicate intentions to one another. Whether expressing emotions, transmitting knowledge, or simply providing entertainment, people express intentions using some form of communication. For instance, gestures, dance, and music can be effective for communicating emotions. Likewise, communication involving verbal language can aid in transmitting information, ideas, and knowledge as well as emotions. This paper traces the development and impact of selected major inventions that have facilitated the communication of intentions involving verbal language (see Figure 1).

These inventions are presented in the light of some important delivery considerations to include: size of audience to receive the communication, distance and speed with which communication travels, ease of duplication and degree of accessibility, level of skill necessary for comprehending the communication, and similarity between the type of communication and its primary source. This list, to be elaborated on shortly, is not exhaustive. Rather, it highlights salient factors to consider when examining each invention. For example, the invention of print allowed for a larger audience than did earlier inventions such as drums, horns, and smoke signals, or even written language.

The earliest attempts to communicate with language probably entailed face-to-face interactions. The transmission of crucial information, myths, and other aspects of culture and day-to-day life became the responsibility of an individual, often times the storyteller. Inventions such as drums, horns, and smoke signals (Schartz, 1982) were remarkable because they allowed the storyteller to communicate information across distance. Two major drawbacks to non-face-to-face communication occurred however. First, comprehension

of these inventions required skills beyond everyday verbal communication. And second, these forms of communication were very abstract facsimiles of the storyteller. As a result, the potential audience who could receive such communications was limited.

With the advent of written language some 8,000 years ago there was a dramatic increase in the distance across which information could be communicated. Written language in the form of scroll, parchment, letter, or book could be carried as far as conventional transportation would allow. Moreover, written language could be stored, and hence retrieved for study and review. Even so, several barriers prevented large audiences from receiving written information. First, duplication of manuscripts required long and arduous hand copying efforts. It could easily take over a year to complete a single reproduction of a large book. Hence, access to written information was severely limited. Second, deciphering written language required a considerable degree of literacy. Generally speaking, two groups were literate during this era: the church, and royal families. Their monopoly on access to and comprehension of information contributed to the concentration of knowledge, power, and wealth among a few.

Informing large audiences remained a problem until the arrival of the printing press in the fifteenth century. Print was probably discovered in China, and movable type made from metal molds was used in Korea about a half century before its advent in Europe. However, Western cultures apparently went unaware of these discoveries until Johann Gutenberg was credited with developing the process of printing from movable type. The first dated printing that used this method occurred with papal indulgence in Mainz, Germany, in 1454. The first book, the Gutenberg Mazarin Bible, was completed the

following year. Print afforded more people greater accessibility to information. The most obvious advancement over previous inventions was rapid duplication of the original message. Several barriers still existed however. Distribution remained dependent upon conventional transportation methods do that dissemination was slow by today's standards. Oftentimes delivery to people in remote areas was prohibitive. Furthermore, comprehension of printed information required print literacy. Nonetheless, the widespread distribution and availability of print served as impetus for an increasingly larger audience to become literate.

The power of print is commonly acknowledged for its enormous influence on developing societies. Since its inception, print has been more than a medium for non-face-to-face communication. It has so dominated the exchange of information and ideas that it has become the structure of the logical mind in the twentieth century (Schartz, 1982).

It is beyond the scope of this paper to examine the invention of print and its complex interaction with subsequent reformations, revolutions, and radical changes in institutions and other significant events that were occurring near its birthplace. But it is interesting to note, for instance, that printing accommodated business and industry through its ability to collect, organize, disseminate, study, and thus discover uniform methods, techniques, and designs for mass producing essential items. The uniformity and mass duplication model that print provided may have initiated the advent of mass production and the resultant industrial revolution.

As means for non-face-to-face communication evolved, each innovation made it easier for people to communicate. The telegraph offered two major improvements: instantaneous and long-distance delivery of information.

Accompanying the improvements were two major limitations. The telegraph lacked the practical ability to communicate its instant information to large audiences and it required literacy in Morse Code to be translated into written language.

The phonograph and the telephone were almost simultaneous discoveries in the late 1870's. Each offered eventful innovations yet retained many of the limitations of previous inventions. The most striking improvement was that they both were capable of presenting information from a primary source in verbal facsimile form. Thus, they did not require literacy in the traditional sense. The telephone offered two-way or interactive communication and was immediate. Following its advent, few persons voiced alarm at the obsolescence of Morse Code. Yet, one might surmise that had the telephone not been invented, many of us (probably those who easily read print) might have telegraphs in our homes. No doubt schools would have offered literacy in Morse Code.

The phonograph could not transmit communications as immediately as the telephone because dissemination required conventional transportation. But it did have the advantage of having its content accessible after its initial offering. Schools have remained so steadfastly immersed in print that the phonograph has not been used to its fullest potential as a medium for information sharing with those who are not benefiting from print. An initial drawback of both phonograph and telephone is that communication was limited to a relatively small audience.

The first motion pictures (which evolved from the invention of the camera) were produced around 1889. This medium was first to provide people with moving visual facsimiles of information from a primary source. And the

information could be accessed after the initial presentation. Yet, several limitations of prior inventions remained. Motion pictures were limited to small audiences because dissemination depended on conventional transportation methods. Also, in the earliest motion pictures, no verbal information was provided so that print literacy was important, and the delay in providing information to audiences was usually significant.

The radio (circa 1912) was a major breakthrough providing instant access to available information. Though it was similar to the telegraph and telephone in its immediacy, it also was wireless. For the first time information could be conveyed rapidly across great distances and to remote places that the telegraph and telephone could not reach. Since it was the first long distance non-face-to-face medium to use airways to transmit information and did not require literacy, it became available to very large audiences. Moreover, information could be delivered directly from the primary source in verbal facsimile form. Nonetheless, early radio had two major limitations. First, there was no quick and concise duplication of the information; therefore, information could not be accessed after the original presentation. This limitation may have influenced schools to minimize its use. It did prove, however, to be an excellent medium of communicating for the political institution. For example, President Franklin D. Roosevelt effectively used the radio to inform listeners (preliterate, illiterate, and literate) of his administration's "New Deal" policies during the depression. His unprecedented four elections testify to the effectiveness of his use of this medium. In addition, advertising agencies integrated radio commercials into their heretofore exclusive reliance on print in order to sell goods and services. The entertainment industry has held a paramount position as the major user of the

radio air waves. Recently, however, 24-hour news networks have begun to operate successfully in supplying information about current events so as to better inform the public at large.

Early television originated around 1928. Though crude by today's standards, by the late 1950's it was providing a quickly growing audience with instant, relatively long-distance visual and verbal facsimiles of primary sources. Currently, about half the people on this planet have access to television. Recently, over two million persons simultaneously viewed various aspects of the 1984 Olympic Games in Los Angeles. There have been several remaining limitations that, until recently, have prevented schools from using this medium in an educational fashion. For example, until the advent of video-tape, initial presentations could not be instantly and concisely stored or accessed. Additionally, with the development of contemporary communication satellites, information can be sent to extremely remote places. And most recently, mini-cameras and mobile microwave transmitters can provide a large audience with immediate information from the scene of an event as it happens.

The computer is the last non-face-to-face communication invention to be considered here. Even though computers became a reality in the mid-1940's, the public at large is only now becoming aware of their seemingly endless potential for storing and delivering information. Schools have embraced this communication medium more readily than any other since the advent of print. Though computers currently possess one primary barrier to easy access, that of print literacy, the very barrier may have given it legitimacy in public education. In the very near future, however, it will be possible to verbally access the massive stores of information that computers possess. In all likelihood that innovation will provide the impetus for many more teachers to become computer-literate.

To summarize, inventors through the ages have engaged in an ongoing, seemingly unconscious, yet systematic attempt to overcome barriers that can prevent effective distribution of knowledge. One barrier discussed here is the accuracy with which the primary source can be represented. For example, early non-face-to-face communication inventions (e.g., drums, horns, and smoke signals) were rather abstract, while recent inventions (e.g., radio and television) provide information seekers with more accurate verbal and visual facsimiles. Other barriers considered include speed and immediacy with which information can be comprehended without special effort or skills; and quick, concise duplication of the original message for study and review. With the development of contemporary communication media, these barriers have been reduced substantially. However, public schools continue to rely on print as their primary source of information delivery. This bias serves to retain access and comprehension barriers that are associated with print.

Given the perspective offered here, several questions arise:

1. Should schools continue to rely on print as the primary source of non-face-to-face information delivery?

2. Are there alternatives to a print curriculum?

3. What might the implementation of an alternative curriculum entail?

4. What are the implications of providing large audiences with substantial volumes of information that can be comprehended in less time than print might allow?

An answer to the first question hinges largely on how one responds to the subsequent questions. Since alternatives to a print curriculum indeed exist, attention is directed to the third question, "What might the implementation of an alternative curriculum entail?" The importance of print cannot

be underestimated and it is not to suggest here that print be supplanted by other media, but rather integrated with them. Print should therefore continue to be an important facet of alternative curriculum. However, audio recorded books, teletexts, video articles, motion pictures, television programs, long distance inter-active verbal communications, and electronic print can provide substantially more information to an increasingly larger audience in a shorter time, with fewer comprehension barriers. Hardware for accessing electronic information might include audio and video cassette players, motion picture projectors, radio, television, and telephone with satellite capabilities and global computer networks. The increasing sophistication of various media makes the possibility of alternatives to print feasible. Finally, in response to question four, some implications of reaching a larger audience in less time are analogous to those that occurred in the mid-1940's when the church relinquished its exclusive access to recorded Christian doctrine. As religious patrons were able to embrace the medium of print, they discovered new interpretations of knowledge regarding the Christian religion. As a result, the church experienced a reformation. However, if the church's intent was to spread religion, then their intentions were realized more quickly than if they had retained their information monopoly.

Schools now face a similar situation in that their almost exclusive use of print represents an information delivery monopoly. Contemporary electronic mediums are capable of delivering instant information to the largest audience ever. For example, over two billion persons on this planet have access to television. These new mediums deliver many types of information faster, more accurately, and cheaper than print. In addition, the limitations that have kept educators from embracing these mediums in the past (i.e., large

audience delivery, duplication, storage, and retrieval of information, and bulky, expensive equipment) have been overcome.

The last remaining barrier lies within the institution of education. Traditionally, inventions change faster than institutions creating what has been referred to as cultural lag. In addition, print is considered more than a medium of information exchange. It has been so effective for so long that it has come to represent the structure of the logical mind (Schartz, 1984). And, thus, is serving as a kind of retroactive inhibitor for change.

In the past, major alterations within this institution have required the prerequisite of societal change. Society began a gradual shift away from their exclusive reliance on print for non-face-to-face information during the post-World War II prosperity era. For instance, in the last 20 years almost every major American city has lost a newspaper. Currently, about 45 percent of Americans rely on electronic media to receive the majority of their current event information. Ninety-nine percent of the American people have television and radio access. For 30 or more years three entertainment networks have dominated the airways. Recently, two major television information news networks have been created and the Public Broadcasting System has tripled its audience in the last three years. Dozens of 24-hour radio news networks broadcast successfully in major cities across the nation. Recent events such as the Olympic Games in Los Angeles were viewed by more than 80,000,000 Americans and over two billion persons around the world. There are over 6,000,000 copies of the novel, Return of the Jedi, in print while some 87,000,000 tickets have been sold to view the motion picture it is based on. Some 30,000,000 preschool children have learned print reading readiness activities and how to count numbers by watching the television series, Sesame

Street, at a cost of about three cents per child. And the series is being reused to educate millions more (Platt, 1984).

Television is preceding print in several Third World countries as their first source of mass information delivery. For example, India has a telecommunication satellite that is providing crucial health, sanitation, and birth control information to a race of people whose future hangs with the success of the project. In addition to the information provided, these programs provide demonstration and modeling procedures that make them more effective than a printed presentation. Finally, narrated television programs can be understood by persons who speak different dialects by simply dubing the desired language in.

In light of these trends it is not surprising that contemporary children demonstrate a diminishing ability to read and write print. However, today's children possess more information from a wider variety of sources than their elders did as children; because they employ a montage of electronic media to receive, collect, and deliver information. American children spend six to seven hours a day in school and four to five hours a day watching television and listening to radio. This is not to say that we live in a post-literate society. Print, however, is becoming a medium with a specialized function. It will be used in conjunction with and not exclusive of other information delivery mediums. Our society is in a transition period in which printed mediums such as money, mail, books, files, and games are becoming electronic.

Information delivery mediums are evolving into systems and networks that are more accessible and easier to comprehend. Schools have only just begun to use these innovations. Recent pleas for a back to basics curriculum are primitive as so[illegible]y evolves on. Basics do not imply backwards direction.

Basics are the minimum tools that one needs to survive in society. Literacy no longer refers exclusively to print. Basics then imply movement forward to keep pace with societal changes. If these new mediums are embraced by the institution of education, reformations similar to those that occurred when the church gave up its exclusive information access can be expected. However, if the intent of the school is to convey information, then those intentions will be realized more quickly than if they retain the access monopoly that print now represents.

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